

# Vaping to quit smoking: Qualitative study of people receiving opioid agonist treatment

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## Abstract

**Introduction:** Most patients receiving opioid agonist treatment (OAT) smoke tobacco. Approved cessation interventions are less effective in this group than the wider population. We investigated how people on OAT experience nicotine vaping to quit smoking.

**Methods:** Patients on OAT randomised to the vaping arm of a smoking cessation trial were invited to participate in structured interviews incorporating broad pre-determined themes. A qualitative descriptive approach employing template analysis was used. Four authors coded transcripts, discussed discrepancies, modified the template using both inductive and deductive approaches. Authors made explicit their starting orientations and independent authors sought disconfirmatory data in a subsequent round of analysis.

**Results:** Four women and eight men (median age 44 years) participated, including four who identified as Aboriginal. Participants reported vaping as cheaper, more acceptable and less stigmatising than smoking but expressed concerns about ongoing accessibility due to the Australian prescription access model. Some found it technically challenging at first, but not more so than standard nicotine replacement therapies. Participants gave accounts of craving and withdrawal experiences, including supplementary use of nicotine patches, and compulsions to vape frequently and intensely, potentially indicating need for higher nicotine dosage. Participants generally reported that vaping helped them quit smoking, though some worried about swapping nicotine addictions. Others were glad to be using a lower-risk alternative.

**Discussion and Conclusions:** This group reported varied experiences of nicotine vaping but were mainly optimistic that it could help them and others quit smoking. This was despite initial nicotine cravings and concerns about remaining addicted long-term.

## KEYWORDS

nicotine, opioid agonist treatment, patient experience, smoking cessation, vaping

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## 1 | INTRODUCTION

Estimates from the 2021 National Drug Strategy Household Survey are that 13% of men and 10% of women in Australia smoked tobacco daily, which is around half the prevalence estimated in 1995 [1], and low compared with other high-income countries. However, in certain population groups smoking remains prevalent. For example, in clinics for people with substance use problems, estimates suggest between 85% and 94% of patients are daily smokers [2, 3].

Pharmacotherapies such as nicotine replacement therapy (NRT), varenicline and bupropion, alone or in combination with behavioural support, are recommended as effective and safe interventions to help smokers quit [4]. NRT is widely used and available in various forms: transdermal patches, inhaler, mouth spray, lozenge and gum; all of which deliver lower doses of nicotine than typical tobacco smoking [5].

Randomised trials of NRT and smoking cessation pharmacotherapies in people with opioid dependence show far lower quit rates than are found in trials including participants without opioid dependence [6]. Some known facilitators of cessation are present in this patient population, namely a high motivation to quit (e.g., [7]) and histories of previous quit attempts (e.g., [8]). However, there is also evidence of poor adherence to the prescribed intensity and duration of smoking cessation pharmacotherapies (e.g., [8]). This may reflect neurobiological interactions that exacerbate nicotine withdrawal symptoms [9], and these patients' exposure to a high prevalence of smoking in their social networks may also impede their efforts to quit [9].

E-cigarettes and other 'electronic nicotine delivery systems' became commercially available in the 2000s, and their use is now pervasive in many countries, including Australia. These small, hand-held devices heat liquid or salts containing nicotine, producing a vapour that users inhale, giving rise to the term 'vaping'. The emergence of electronic nicotine delivery systems created scientific, regulatory and terminological challenges for the tobacco control field. While electronic nicotine delivery systems better encompasses the variety of devices available, the term 'e-cigarette' is used more widely. The fact that vaporisers, or 'vapes', sometimes do not contain nicotine or may contain high concentrations of nicotine, has important implications for research and public policy. For clarity, we mainly use the term 'nicotine vaping'.

Compared with the United Kingdom, the United States and New Zealand, Australia has adopted restrictive policies on nicotine vaping. This reflects concerns about nicotine addiction in children and young people, uncertainty about long-term health risks, and scepticism about

the effectiveness of nicotine vaping for smoking cessation [10]. The regulatory framework in place from 1 October 2021 made the importation and sale of nicotine vapes illegal, except by pharmacies to patients with a doctor's prescription. Despite this, many individuals imported vaping devices on the pretence that they did not contain nicotine. These regulations have since changed and as of 1 January 2024, importation of any vaping products, with or without nicotine, has been banned [11].

Previous cross-sectional research has explored e-cigarette use in patients on opioid agonist treatment (OAT), primarily using quantitative methods to report frequency, preferences and other factors associated with daily use [12–14]. Recent Australian survey data found that patients on OAT thought e-cigarettes were helpful for cessation purposes but would be more inclined to use NRT [15]. A mixed-methods study with patients on OAT explore their experiences with e-cigarettes in the US context, citing perceptions of vaping safety and effectiveness for quitting cigarettes, as well as concerns about addiction replacement and the inability of e-cigarettes to adequately substitute for cigarettes [16].

We conducted the current research in the context of a randomised trial involving people receiving OAT allocated to either nicotine vaping (i.e., being provided with a device and nicotine liquid for a period of 12 weeks) or NRT (a combination of transdermal patches and oral forms including inhalators, gum, lozenges, mouth spray). Our aim in this study was to understand participant experiences of vaping, including perceived effectiveness and other impacts on physical, emotional and social wellbeing. Results will highlight Australian perceptions in a population of OAT patients who have undergone 12-weeks treatment with nicotine vaping for smoking cessation.

## 2 | METHODS

### 2.1 | Design

We conducted an exploratory qualitative sub-study in the context of HARMONY, an open label randomised superiority trial comparing nicotine vaping against NRT for smoking cessation (<https://www.australianclinicaltrials.gov.au/anzctr/trial/ACTRN12621000148875>).

### 2.2 | Eligibility

To be included in HARMONY people receiving OAT who smoked cigarettes could not have vaped nicotine for at least the preceding 30 days. We invited participants at the Newcastle study site who had been allocated to the

nicotine vaping arm of the trial to participate in this qualitative sub-study.

### 2.3 | Vaping device and nicotine liquid

In the HARMONY trial participants in the nicotine vaping arm were given, at no cost to them, an Innokin Endura T18-II starter kit comprising a refillable, open tank-style vaporiser loaded with 12 mg/mL unflavoured e-liquid, and a further seven 12 mg/mL bottles intended to last 12 weeks. At the baseline visit, participants: received written information on how to use the device, including vaping and vaporiser facts sheets and study pamphlet; watched study training videos; and had opportunity for questions and discussion with research staff. Participants were also provided with a 7-day supply of 21 mg nicotine patches, to assist with nicotine withdrawal if needed.

During scheduled trial visits and when contacted outside visits, participants received support to use the vaporiser (including how to change coils, re-fill the e-liquid etc.) from the research team. Additional replacement coils were supplied on request.

### 2.4 | Informed consent and ethical approval

Patients who agreed to participate in this qualitative sub-study signed a consent form confirming that they understood the study aims and methods, that the interview would be recorded, and that they would not be personally identified. The Hunter New England Local Health District Human Research Ethics Committee approved the study protocol (Reference: 2020/ETH01866).

### 2.5 | Interviews

Interviews were conducted over a 2-week period in August/September 2022. Four of the authors (Amanda Shui, Andrew Li, Vinogi Sathasivam, Kirsten Wright) conducted interviews face-to-face or by telephone, and all were recorded. The structured, interview was designed to explore a pre-determined set of themes that included pre-study experiences of tobacco smoking, implications of vaping on nicotine use, implications of vaping on opioid use and treatment, post-study vaping and tobacco use. It started with open-ended questions, and used follow-up questions to prompt participants, allowing a deeper investigation of themes (see Table 1). A specialist agency transcribed the recordings and the interviewer proofread transcripts and amended them where necessary.

### 2.6 | Qualitative approach

This research was guided by Qualitative Description, a pragmatic, low-inference method that is informed by naturalistic enquiry [17]. This is a method used widely in health research where a straightforward description of participant experience and perceptions about an intervention are required [18]. Qualitative methods provided a more explorative investigation, adding context and value to the quantitative data.

### 2.7 | Analysis

We employed template analysis to examine interview transcripts [19]. This method involves coding text and organising it thematically and hierarchically from a contextual constructivist perspective with a view of knowledge as subjective [20]. Accordingly, we had multiple independent analysts each critically reflect on the interview data, then meet to discuss their interpretation of the transcripts in several iterations.

On reading each transcript, four authors (Amanda Shui, Andrew Li, Vinogi Sathasivam, Kirsten Wright) individually created a set of codes and produced a draft template of themes and sub-themes they workshopped in a series of meetings. Coding structure was derived deductively based on the structured interview guide and inductively as new topics emerged.

In a second round of analysis, Melissa Jackson, Emma Austin, Kypros Kypri and Adrian J. Dunlop considered the codes in the context of the study aims and interview questions, re-grouping them into six broad themes that include general perceptions, vaping versus other cessation methods to quit or reduce tobacco use, nicotine dose matters, swapping forms of nicotine dependence, health and treatment impacts, and acceptability and stigma reduction. We developed and tested hypotheses about the meanings participants had conveyed by returning to the transcripts to check these abstractions against the raw data [21].

#### 2.7.1 | Positionality and disconfirmation

We are a team of researchers including then fourth-year medical students (Andrew Li, Amanda Shui, Vinogi Sathasivam, Kirsten Wright) and staff who care for (Adrian J. Dunlop) or undertake research to guide the care of (Adrian J. Dunlop, Melissa Jackson, Emma Austin, Kypros Kypri) patients of the Drug and Alcohol Service of a Local Health District in Australia. Billie Bonevski is an associate investigator who has led trials of nicotine vaping for smoking cessation.

**TABLE 1** Semi-structured interview questions.**Before enrolling in the HARMONY trial**

We'd like to know about your experience smoking tobacco before you became involved in this study ...

1. What did you smoke and how often?
2. Have you tried quitting before?
  - (a) If yes, with what and how did it go?
  - (b) If no, what made it difficult?
3. What did you think kept you smoking tobacco?
4. Have you tried vaping nicotine before you joined this study?
  - (a) If no, why not?
  - (b) If yes, why didn't you continue vaping?
5. Before you joined the study, were you hoping to be in the Vape or NRT group?
6. What did you think the chances were that vaping would help you to stop smoking?

**During the trial**

Implications of vaping for nicotine use: Now we'd like to know about your experiences during the study, with vaping nicotine ...

7. What did you like and dislike about vaping?
8. What was it like learning to use the device?
9. Were there things that made it easy or difficult to use?
  - (a) Did the device work ok?
  - (b) Did you experience the pleasing nicotine effect?
10. Did you experience any nicotine withdrawal or side effects? If so, can you tell us more about these?
11. Compared with smoking, did vaping have any effect on your nicotine cravings?

Implications for opioid use: Now we would like to know how vaping affected your opioid or other drug use

12. Once you joined the study, and started vaping, did you find yourself using other methods to relieve cravings (e.g., using heroin/other drugs, relaxation to reduce stress)?

Interactions with opiate treatment

13. Some patients find that their desire to smoke increases shortly after receiving methadone or bupe. Did you experience this with your smoking?
  - (a) Did you find that you smoked more?
  - (b) How long did that last?
14. Since you've been vaping, have you noticed similar effects?
  - (a) If yes, how does it compare to the effect of smoking?
15. What is similar about being on buprenorphine or methadone (to cut back on heroin or other opioids) and vaping nicotine (to cut back on tobacco) for you?
  - (a) Do you worry you might be swapping one type of addiction (smoking tobacco) for another (vaping nicotine)?
  - (b) How do you feel about continuing to vape in the longer term (e.g. months or years)?
16. What do you think is good and bad about vaping nicotine in the long term?

**After the trial**

17. Will you consider continuing to vape nicotine?
  - (a) If not, what would stop you from continuing to vape nicotine?
  - (b) If you have used other methods to stop smoking in the past, how does vaping compare?
18. Do you think you would recommend vaping to stop smoking cigarettes to other people? Why or why not?

Nicotine vaping has divided the tobacco control field globally. The staff authors started this research with cautious optimism about the potential utility of nicotine

vaping in this patient population, reflected in efforts to generate knowledge to improve clinical care. We communicated this orientation to the medical student authors

whose research we supervised. We judge this view to prevail in Australia among practitioners and researchers working with patients who have substance use or other significant mental disorders, or who suffer other social disadvantage (e.g., [22]), currently smoke tobacco, and have been unable to stop with current smoking cessation interventions. It stands in contrast to the position commonly taken by public health practitioners and researchers whose focus is primarily the risks of a poorly regulated market for vaping products (e.g., [23]).

We have adopted methods in the service of impartiality specifically to offset biases arising from our clinical focus [24], also referred to as positionality [25]. Principal among the methods we deployed was a determined search for disconfirmation of the inferences we drew from analysis of interview data [26]. In a study phase designed to minimise confirmation and other bias, one author (Kypros Kypri) prepared a summary of the results, and two authors (Emma Austin and Melissa Jackson) independently reviewed a sample of transcripts specifically looking for participant comments that were inconsistent with that summary. They modified the coding system to include new higher and lower order categories, clarifying the boundaries of certain concepts, and then recoded the remaining transcripts between them.

After a detailed discussion of a revised presentation of the results with Emma Austin and Melissa Jackson, Kypros Kypri redrafted the results section of the manuscript and circulated it to all the authors for review. Keeping in mind our starting positions, we then wrote the discussion with all authors contributing to or reviewing a full draft of the paper.

### 3 | RESULTS

Interviews were conducted with 12 participants, representing 23% of those randomised to the nicotine vaping arm at the Newcastle site. All had either completed the study or were in the follow-up period. Table 2 summarises demographic and smoking characteristics of these participants who were aged 31–53 years (median 44 years) and reported smoking 15–50 cigarettes per day (median 20 per day) upon enrolling in the HARMONY trial. At end of the 12-week treatment, 4/12 reported using no tobacco products. Eleven of 12 were using vaporised nicotine products.

Below we present our analysis of the interviews under six theme headers related to vaping: (i) general perceptions; (ii) vaping versus other cessation methods to quit or reduce tobacco use; (iii) nicotine dose matters; (iv) swapping forms of nicotine dependence; (v) health

and treatment impacts; (vi) acceptability and stigma reduction. We quote participant comments as examples or to indicate the sentiment we judged to underlie the themes, with reference to Table 2 which presents the participant number ‘#’, gender, age, self-reported smoking before the trial and self-reported smoking status at the time of interview.

#### 3.1 | General perceptions

Information was gathered on participants perceptions of vaping. These related to earlier experience with vaping, usability, cost and accessibility. Several participants reported having vaped before signing up for the HARMONY trial, some of them stopping because they disliked the taste. For example:

‘I tried the fruity vapes before ... No, I don’t like them’.

(#11, 37-year-old woman)

Of those who had not previously vaped, some cited lack of interest, while one participant equated vaping with smoking:

‘I was happy doing what I was doing, so I was like, “Why swap?” It was just another form of smoking’.

(#5, 35-year-old woman)

Another had been encouraged to take up vaping to help him quit smoking:

‘I only just tried it because somebody said have a go at that. I thought it was a good idea to give up smoking’.

(#7, 39-year-old man)

In terms of device usability, participants generally found the vaping device easy to use though some experienced technical difficulties:

‘Where you put your liquid in is glass and obviously, every now and then, you drop it and the glass breaks’.

(#3, 31-year-old man)

‘I was changing the coils too quickly and I ran out of coils. So, I had to be told how to change them properly and when to change them’.

(#11, 37-year-old woman)

TABLE 2 Participant characteristics.

Participant number	Age, years	Gender	Aboriginal or Torres Strait Islander	Cigarettes smoked per day before trial	Experience of vaping before treatment	Self-reported smoking status at interview	Current use of tobacco products (excluding vape) at end of treatment			Smoked at all, even a puff, in last 7 days? (at end of treatment)
							Experi- ence of vaping before treatment	Self-reported smoking status at interview	Current use of tobacco products (excluding vape) at end of treatment	
1	32	Man	Yes, both Aboriginal and Torres Strait Islander	15	Only tried but no more than a couple of times	Quit	Not at all	Not asked	Yes, on 5 or less occasions	Not asked
2	51	Man	No	20	Only tried but no more than a couple of times	Reduced	Daily	Daily	Not asked	Not asked
3	31	Man	Yes, Aboriginal	20	Tried a few times	Quit	Not at all	Daily	Yes, on 5 or less occasions	No
4	53	Man	No	30	Never used	Not asked	Daily	Not asked	Not asked	Not asked
5	35	Woman	Yes, Aboriginal	20	Never used	Reduced	Daily	Not asked	Not asked	Not asked
6	48	Woman	No	15	Only tried but no more than a couple of times	Not asked	Daily	Not asked	Not asked	Not asked
7	39	Man	No	20	Only tried but no more than a couple of times	Quit	Daily	Daily	Not asked	Not asked
8	53	Man	No	35	Never used	Reduced	Daily	Not asked	Not asked	Not asked
9	45	Man	No	20	Used regularly in past, but not in the past month	Reduced	At least once a week	Daily	Not asked	Not asked
10	49	Woman	No	50	Only tried but no more than a couple of times	Reduced	Daily	Daily	Not asked	Not asked
11	37	Woman	Yes, Aboriginal	20	Only tried but no more than a couple of times	Not asked	Not at all	Daily	Yes, on 5 or less occasions	Not asked
12	43	Man	No	20	Used regularly in past, but not in the past month	Not asked	Daily	Not asked	Daily	Yes

Other aspects of usability that participants identified related to taste and feel. Some noted the different flavour and ‘hit’ from vaping compared to smoking, at least initially:

‘[vaping is] a totally different taste, feeling. You don’t get head spin ... So at the start it was a different feeling, but I’m used to it now’.  
(#2, 51-year-old man)

In terms of cost, most participants noted that vaping was much cheaper than smoking:

‘It’s a couple hundred dollars a week to smoke tobacco. It’s a lot cheaper to just vape’.  
(#12, 43-year-old man)

‘I used to buy three packets of tobacco a week and they’re \$30 each ... [now] I can eat steak instead of mince’.  
(#2, 51-year-old man)

Participants in the HARMONY trial received enough nicotine liquid for the 12-week treatment duration, but some expressed concerns about ongoing accessibility:

‘It’s just hard with the oil, because I’ve got it from New Zealand, it takes so long to get here ... very hard to get it. Anywhere I try to get my prescription filled, anywhere around here, we couldn’t’.  
(#3, 31-year-old man)

Another participant suggested the possibility that the nicotine liquid be prescribed by general practitioners:

‘If it was done by a doctor’s surgery, it’d be a lot easier too. Yeah, that guidance sort of thing by a GP [general practitioner] or something’.  
(#12, 43-year-old man)

### 3.2 | Vaping versus other cessation methods to quit or reduce tobacco use

Participant views were overwhelmingly supportive of vaping as an effective way to stop or reduce tobacco use and many comparisons were made to previous efforts with NRT. Notably, several participants reported negative experiences of NRT which they found a poor substitute for smoking, for example:

‘I didn’t have the most confidence in being successful with patches ... They might deal

with the cravings, but they don’t deal with the feeling of actually having a cigarette’.  
(#1, 32-year-old man)

Participants also found the vaping device no more difficult to use than NRT products:

‘[Vaping is] a lot easier than opening up the patch and then sticking it on your arm’.  
(#2, 51-year-old man)

‘You can carry it around with you, that was the main thing’.  
(#7, 39-year-old man)

Participants suggested that being able to replicate the hand-mouth and exhaling motions of smoking gave vaping an advantage over NRT as a cessation aid:

‘It will help a serious smoker a lot more because I know I’d feel like they’d still want to feel like they’re still having a smoke’.  
(#3, 31-year-old man)

Others noted that vaping was a good alternative when trying to quit and socialise with other smokers.

‘So, when you see someone pull out a smoke, but you’re giving up, you can still pull out the vape, and it takes that part away’.  
(#7, 39-year-old man)

Several participants reported that vaping had helped them cut down where other methods had not, or that vaping might be useful in combination with existing treatments:

‘So this worked, but not as much as I would’ve hoped ... It cut me down. Cut me right down’.  
(#10, 49-year-old woman)

‘Well, it just kind of works. It’s cutting me right down, the vaping. The other stuff didn’t’.  
(#8, 53-year-old man)

‘I think for the first few weeks, if I was to stop smoking altogether, I would like the vape for the first few weeks because it’s still about that movement and about blowing out the smoke and all that sort of thing. And then give me two or three weeks and I would prefer to swap

over to the patches or Champix [a medication prescribed for smoking cessation]’.

(#5, 35-year-old woman)

Even where participants had not succeeded in quitting, they envisaged vaping to maintain a lower level of smoking tobacco, for example:

‘I’d only buy one pouch of tobacco, and I don’t hardly touch it now. I only use my vaper. I’m stoked with that because I was a really heavy smoker for over 20, 30 years’.

(#2, 51-year-old man)

‘No, I’ve decreased. I was smoking two, two-and-a-half pouches and I’m only smoking one if that ... Sometimes I make it through a whole week with still smokes left’.

(#5, 35-year-old man)

Overall, participants expressed positive views about the effectiveness of nicotine vaping to help them and others quit smoking, even where they might have been sceptical to begin with. For example, referring to his expectations before the trial, one participant said:

‘I didn’t actually put too much thought into it. That might be the reason it was so successful was I went into it open-minded. There was no thought about winning or losing, I just came in day by day’.

(#1, 32-year-old man)

Some views encompassed the reputed harm reduction function of vaping alongside the desire to abstain from nicotine completely:

‘I’d like to give it [vaping] away too, but my main thing was at least I’ve given up smoking’.

(#7, 39-year-old man)

‘I’m going to quit altogether, totally, eventually. But until I can, I’m going to keep vaping’.

(#9, 45-year-old man)

### 3.3 | Nicotine dose matters

Several participants reported feeling no withdrawal effects or craving after they replaced smoking with vaping. Others spoke to the lower potency of vaping versus

smoking, in terms of nicotine delivery, in a variety of ways, for example, saying that to get the same effect they had to vape more intensely than they might smoke:

‘I’d have to have five or six puffs of the vape to get the effects of one or two draws on the cigarette’.

(#5, 35-year-old woman)

This perhaps made the first weeks of the trial a period in which some participants were particularly vulnerable to external cues:

‘At the start, I was using it a lot more. I’d see people having a smoke and then I’d be going, boom, have mine [vape]’.

(#3, 31-year-old man)

Some participants reported success in relieving nicotine withdrawal symptoms by vaping:

‘I [had withdrawal symptoms] for a couple of days, but I just have a vape and then try to forget about having a cigarette’.

(#2, 51-year-old man)

Others reported using cigarettes or NRT as a supplement to vaping:

‘When I was having real bad days, then I’d put a patch on to help’.

(#9, 45-year-old man)

Consistent with the lower potency of vaping (at least with the liquid nicotine provided in the HARMONY trial), patients expressed optimism that they would eventually cut back on vaping, for example:

‘At the start, I was vaping a lot more and then gradually, over time, it died down to every now and then. And then some days, it’s longer than others. Some days it would vary’.

(#3, 31-year-old man)

### 3.4 | Swapping forms of nicotine dependence

A common scenario for individuals with addiction is to replace one addiction with another. Participants were somewhat polarised on whether they were concerned

about remaining addicted to nicotine even if they managed to quit smoking. For example:

‘I don’t want to quit smoking and pick up another vice’.  
(#5, 35-year-old woman)

‘Well, I found that it was like I was replacing the cigarettes with the vape. And then it was like, “If I replace the cigarettes with the vape, then how am I going to get off the vape?”’.  
(#5, 35-year-old woman)

Drawing parallels with her other substance use, one participant described her concerns about vaping thus:

‘I’m a person that gets addicted to things very easily. When I had a heroin problem, I had a cocaine problem, a speed problem. I think I’ve never had a pot problem though. I do worry that I’m swapping the cigarettes for another addiction ...’  
(#10, 49-year-old woman)

In contrast, others were more focused on replacing cigarettes with a less harmful alternative:

‘Yeah. It’s a lot healthier than what cigarettes are’.  
(#6, 48-year-old woman)

Or they found the feeling of being addicted to vaping short-lived and were optimistic of eventually quitting the vaping too:

‘At first I thought I might be [“swapping the addiction of tobacco with the addiction of vaping nicotine”], because I was using it a lot, but once I started to not use it as much, I didn’t seem to think that’.  
(#9, 45-year-old man)

‘I would say use it as a tool to help yourself to give up, but not to replace the smoking’.  
(#10, 49-year-old woman)

### 3.5 | Health and treatment impacts

Participants spoke of a wide variety of health effects of smoking cessation and vaping, some of them immediate, for example, a sore throat or light-headedness after

vaping, and some more significant, for example, improvements in breathing and chest pain:

‘Before I started [vaping] my breathing was really bad to the point where I was waking up three or four times a night, I couldn’t breathe and my phlegm was thick as ... my phlegm’s still thick, but not as bad’.  
(#10, 49-year-old man)

‘Seemingly breathing easier. Getting less chest pains’.  
(#1, 32-year-old man)

Or they reported gaining weight:

‘I’m eating more so I’ve actually put on a bit more weight’.  
(#3, 31-year-old man)

‘I put on a bit of weight when I first gave up. I was cutting back and I think I was eating a little bit more. But now, I’ve started losing that weight again’.  
(#5, 35-year-old woman)

While many emphasised health benefits of vaping over smoking, some expressed concerns about the long-term health effects of vaping:

‘Just not knowing enough about it. Is it doing long term damage, or anything like that?’  
(#7, 39-year-old man)

Some such concerns appeared to reflect encounters with scientific claims and other mixed messages:

‘I’ve actually read some research about vaping, and it seems like it’s worse for you than smoking, all the chemicals that are in it’.  
(#11, 37-year-old woman)

‘Not knowing completely heaps about it, that bothered me. So you hear one thing from one person, and then another from another person that says it’s bad, another person says it’s good ...’  
(#7, 39-year-old man)

Most participants reported no discernible impact of vaping on their opiate treatment or vice versa. Two noted that vaping increased after dosing, although this

alleviated over time. Another reported more opioid withdrawal discomfort and related this to increased vaping.

‘At first I did, but then I just cut down ...’  
(#6, 48-year-old woman)

‘I would say I did feel like I was, the [opioid] withdrawal would come on earlier sometimes ... once or twice a week’.  
(#1, 32-year-old man)

### 3.6 | Acceptability and stigma reduction

The acceptability of vaping was widely acknowledged, particularly in terms of the reduced social stigma of vaping compared with smoking, for example,

‘People didn’t stick their nose up at you if you were [vaping] near them’.  
(#11, 37-year-old woman)

‘But with the vape, I definitely found that it was like I was just replacing [cigarettes] but with a more socially acceptable thing’.  
(#5, 35-year-old woman)

Acceptableness of vaping by family members, including children was also highlighted.

‘They [kids] think it’s better. They’ve said they would much rather me vaping, it doesn’t stink’.  
(#3, 31-year-old man)

#### 3.6.1 | Socio-demographic consistency

Generally, older participants had longer smoking histories and younger participants expressed views suggesting they were more open to vaping nicotine. There was, however, no marked socio-demographic variability in participant experiences according to their gender or Indigenous status.

## 4 | DISCUSSION

This qualitative study describes the experience and perceptions of 12 clinical trial participants who completed 12-weeks treatment using a nicotine vaping device supplied to help them stop smoking. Participants who continued vaping reported finding it cheaper than smoking but were concerned about ongoing nicotine accessibility.

These concerns are context specific given the Australian prescription access model. Difficulty finding a general practitioner willing, or with the knowledge, to prescribe a nicotine product has been published previously [27] and anecdotally cited by OAT patients involved in the HARMONY study. Alternative sources from overseas supplies are illegal, and difficulties navigating the online environment and finding unflavoured nicotine similar to what they had previously been using, meant many participants were hesitant to access nicotine this way.

Some participants found the vaping device technically challenging at first, but not more so than standard nicotine replacement therapies. Overall, they were supportive of vaping as an effective way to stop or reduce tobacco use and direct comparisons were made to previous efforts with NRT. As previously reported [16], the behavioural similarities of vaping and smoking and the ability to engage socially with others who smoke were cited as advantageous aspects of vaping. The support for vaping appears to contradict findings that OAT patients would be more inclined to consider NRT when quitting tobacco [15] and may be explained by the design of the study as participants received education specific to vaping for smoking cessation.

Participants spoke of craving and withdrawal experience, supplementary use of nicotine patches, and compulsions to vape frequently and intensely, particularly early in the treatment period. Although there is little evidence that higher nicotine concentrations in vapes lead to higher quit rates [28] craving and withdrawal symptoms do predict a return to tobacco smoking [29]. It is possible that the 12 mg/mL nicotine liquid provided was not enough to alleviate these symptoms in participants, who all identified moderate to heavy tobacco use at baseline. It could also explain why most reduced tobacco but continued to smoke cigarettes while also vaping. Eighteen milligram per millilitre nicotine liquid concentrations have been identified as most popular among people who vape [30] and in other clinical trials comparing vaping to NRT in adult populations, concentrations of between 16 and 18 mg/mL have been used [28].

Participants were mainly optimistic that vaping would help them quit smoking, though some worried about remaining addicted to nicotine. The heightened concern regarding addiction replacement is not new among OAT patients [16] and possibly reflects their common, lived experience of stopping other substances. Others said they were glad to be using a lower risk alternative, while also noting physical health improvements, greater social acceptability and reduced stigma related to vaping. Given the well-established shared biological underpinnings of nicotine and opioid addiction [31], reports that vaping may impact current opiate treatments not surprising and is an area deserving further exploration.

Participant concerns about scientific claims regarding harm from vaping are worthy of consideration. Unqualified statements in the media about the health risks of vaping (e.g., 'Recent reports have found over 200 unique chemicals used in e-liquids' [32]) may deter smokers from choosing, and clinicians from prescribing, a mode of nicotine delivery that is probably much less harmful than smoking [32]. A recent survey of 91 OAT patients and 10 clinicians in NSW showed that most patients had tried to quit smoking at least once, and 43% were currently trying to quit. Patients expressed optimism that nicotine vaping would help them quit, preferring that to prescription medications varenicline and bupropion. In contrast, the 10 clinicians surveyed did not consider nicotine vaping a useful cessation aid [15].

Strengths of the study include methods designed to enhance transparency and rigour, facilitating insight into participant attitudes, beliefs and experiences. The study possesses what Giacomini and Cook [33] consider the four essential elements of qualitative research in health care. First, we employed a reasoned recruitment approach, selecting eligible clinical trial participants who were heterogenous in age, gender and Indigenous status. Second, our data collection method matched the study objectives. Semi-structured interviews framed the scope of the enquiry in terms of our knowledge of this patient group and existing evidence on smoking cessation, while allowing scope for new observations and ideas to emerge. Third, the analysis indicates that interviews elicited data covering a broad spectrum of relevant participant experience, with prompts and interviewer openness eliciting ideas we did not necessarily envisage when designing the study. Finally, by deploying the large author team to analyse the data iteratively with researchers listening to the interviews independently and seeking disconfirmatory evidence, we ensured a robust analysis was produced. These methods align with the contextual constructivist perspective underpinning template analysis [20] and enhance the validity of the conclusions [33].

Limitations of the research are principally matters of external validity arising from so-called 'research participation effects' [34] including how the purpose of the study affected which HARMONY trial participants volunteered to be interviewed. Record linkage studies show that people who participate in clinical trials of treatments for somatic conditions tend to be healthier prior to study enrolment than eligible people who do not participate (e.g., [35]). Relatedly, non-respondents in population health surveys have higher mortality than respondents, principally due to smoking related causes (e.g., [36]). We are not aware of equivalent data in patient populations defined by their substance use, particularly where all eligible individuals belong to a stigmatised group. Furthermore, the participants in our study are all from a single

region in Australia, so we caution against generalising the findings to all OAT patients.

Another limitation is due to the rapid progression of vaping technology, such that the device given to participants in the HARMONY trial in 2021–2022, a so-called open tank system, has been overtaken by closed system 'pod base' and disposable vapes. These newer devices are easier to use and reduce the risk of fluid leakage. Accordingly, we would expect people who, like some of our study participants, were deterred by usability challenges presented by older technology, to be more favourably disposed to using the newer devices.

There are several ongoing trials of nicotine vaping for smoking cessation likely to broaden the existing evidence base, for example, studying effects in people of low socioeconomic status (e.g., [37]). The HARMONY trial from which the current study participants were recruited, completed its recruitment in August 2023, and remains the only clinical trial of nicotine vaping for smoking cessation in this vulnerable group. This study of patient experiences gives cause for optimism that if shown to be safe and effective, nicotine vaping may improve patients' lives and help reduce the burden of disease from tobacco.

#### AUTHOR CONTRIBUTIONS

Each author certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors.

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#### CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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